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Abstract: In this work, an arc ion plating (AIP) setup equipped with an arc splitting system was used to prepare AlTiN coatings (s-AlTiN). For comparison, AlTiN coatings were also deposited via conventional AIP (c-AlTiN). The chemical composition, microstructure, hardness and wear properties of the two different coatings were studied by scanning electron microscopy, transmission electron microscopy, energy dispersive X-ray spectroscopy, X-ray diffraction, glow discharge optical emission spectrometry, nanoindentation tests and pin-on-disk tests. The cutting performance of end mill tools coated with the two different AlTiN coatings was investigated by dry milling hardened steel and the wear mechanisms are discussed. The results showed that the s-AlTiN coating exhibited a much smoother coating surface and a denser microstructure instead of the typical columnar structure of the c-AlTiN coating. Furthermore, the s-AlTiN coating exhibited a higher hardness, a lower friction coefficient and a better wear resistance compared with the c-AlTiN coating fabricated through conventional AIP. The application of the s-AlTiN coating was found to significantly improve the tool life.

Keywords: AlTiN coating; Arc splitting; machining; Wear morphology